

EXECUTIVE SUMMARY

The mission of the National Park Service is “to conserve unimpaired the natural and cultural resources and values of the national park system for the enjoyment of this and future generations” (NPS 2000). To uphold this goal, the Director of NPS approved the Natural Resource Challenge to encourage national parks to focus on the preservation of the nation’s natural heritage through science, natural resource inventories and expanded resource monitoring (NPS 1999). Through the Challenge, 265 parks in the national park system were placed into seven regions and, subsequently, organized into 32 inventory and monitoring networks. The parks of the Greater Yellowstone Network include Yellowstone National Park, Grand Teton National Park, John D. Rockefeller, Jr. Memorial Parkway and Bighorn Canyon National Recreation Area.

Each network of parks that receives funding for monitoring is required to prepare a vital signs monitoring plan. The purpose of this plan is to establish the vital signs (i.e., indicators of ecosystem health), explain the approach used to develop sampling designs and protocols, and analyze, manage and report on data. In addition, the report includes a data and information management plan that guides the long-term management of data essential to the monitoring program.

The GRYN took a multi-step approach to identifying and selecting vital signs. One essential step involved the use of conceptual ecological models. Conceptual models prepared by the GRYN explain the structure, function and interconnectedness of park ecosystems, enabling the identification of vital signs for assessing ecosystem health. In addition to conceptual modeling, the GRYN used a Delphi survey and a workshop series to further identify and prioritize vital signs. The Delphi survey was an Internet-based questionnaire sent to subject-area experts and park personnel that asked participants to nominate possible vital signs for monitoring and then rank them on a scale of importance. The GRYN then held park-specific workshops to gain further insight from park staff and managers and also hosted a “vital signs monitoring workshop,” during which invited

subject-area experts and park managers judged dozens of candidate vital signs against 13 selection criteria. These criteria considered the ecological and managerial relevance, response variability, feasibility of implementation and interpretation and utility of the candidate vital sign. The outcome of the workshop was a ranked list of potential vital signs.

Using the workshop list of highly ranked vital signs, the Technical Committee (a steering committee made up of NPS representatives) developed the final list of vital signs for monitoring, including a subset to be monitored primarily using I&M funds. It is impossible for any single monitoring program on a limited budget to develop a complete picture of ecosystem health with its staff and funding alone; thus, the network’s subset of 12 vital signs were chosen to fill gaps in current monitoring in the parks and allow I&M resources to be spent on issues that had high management relevance and would create a more complete picture of ecosystem health when synthesized with ongoing monitoring of other vital signs.

The vital signs chosen by the network include a suite of physical, chemical and biological elements and processes that collectively represent the overall health or condition of park resources. These vital signs, as presented within the vital signs framework as developed by the National Park Service vital signs monitoring program, include four related to air and climate, seven related to geology and soils, 11 related to water, 19 related to biological integrity, three related to human use and three related to ecosystem pattern and processes.

The subset of 12 vital signs that will be funded by the GRYN include: climate, water chemistry, aquatic invertebrate assemblages, streamflow, arid seeps and springs, invasive plants, exotic aquatic assemblages, whitebark pine, amphibians, landbirds, soil structure and stability and land use. Following approval by the BOD in August 2003, the network began work on developing specific monitoring objectives, sampling designs and protocols for these vital signs.

Since the selection of the vital signs, the GRYN has begun to focus

on the development of the monitoring program, emphasizing three particularly important elements of any monitoring program: 1) applicability; 2) reliability (i.e., scientific defensibility); and 3) feasibility. Sampling design is one of the major means by which the GRYN ensures scientific reliability and defensibility. Sampling design ensures that data collected are representative of the target populations and sufficient to draw defensible conclusions about the resources of interest.

Sampling designs are described in individual monitoring protocols, which are detailed plans that explain how data are to be collected, managed, analyzed and reported. The GRYN is working to prepare and implement 12 monitoring protocols by 2007. In most cases, full implementation of these protocols will be preceded by field testing, except when protocols are well established and substantial refinement is not anticipated. Field testing will be followed by revision of the protocol before full implementation can begin.

As network monitoring protocols are approved and implemented, planning will shift towards helping update and/or revise existing park-sponsored monitoring protocols. The technical expertise of network staff can help to standardize procedures and establish quality control, data management and reporting protocols. This planning step will help promote coordination and communication of monitoring activities and should encourage broad participation in monitoring and use of resulting data.

The management, analysis and reporting of monitoring data become especially important once long-term monitoring has commenced. Data management is an important aspect of the I&M program, as it provides guidelines for all aspects of data handling. Data and information management in the GRYN will attempt to support an adaptive, yet consistent, approach to managing and delivering a useful suite of natural resource inventory and monitoring data and information. This will be achieved by including written data management procedures and responsibilities in each monitoring protocol.

Data analysis and reporting are also essential components to monitoring long-term ecosystem health, due to the importance of communicating information gained through monitoring to various constituents. While analysis techniques will vary depending on the sampling design, all analytical methods will ensure that the program meets the national goals of monitoring. In addition, the GRYN will use a set of reports to target a variety of audiences in order to make this information useful to numerous end users. Another reporting mechanism that will be used by the GRYN is the expansion of its Web-based interface. This Web-based communication mechanism will allow the GRYN to provide background data and information to a large audience with relative ease, due to its widespread accessibility to park managers and the relative simplicity of providing updates when new information is acquired.

The monitoring schedule and staff requirements of the program will be driven by the overall monitoring design and resultant technical needs. Currently, three core NPS staff positions (the program manager, data manager and ecologist) are assigned to the GRYN. In addition, affiliated NPS staff at the network parks and affiliated University staff at Montana State University provide a flexible pool of individuals to plan and implement monitoring protocols. Once the monitoring program is fully operational, a schedule of monitoring frequencies will enable the network to develop permanent staffing plans and allocate funding resources. Changes in available funds for monitoring will be mitigated by one or both of the following opportunities: 1) opportunities for cost-sharing with partner agencies or organizations; and 2) adjustments in the scope of monitoring that can be conducted. A periodic program review will allow for adjustments in budget and staffing to be made on an intermittent basis with approval from oversight committees. In addition, this review will evaluate the efficacy of monitoring by reviewing individual protocols and monitoring plans.